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SERIAL PUBLICATIONS IN LARGE LIBRARIES: MACHINE APPLICATIONS

While many areas of library operations can be improved or even radically transformed by automation, the one area that probably stands to gain most, and needs the most help, is serials. It has been well known for ages that the irregularity and inconsistencies of serials can unhinge any librarian, but a new revelation of the automation age is the unhinged computer programmer. It is unfortunate that the irrationality of publishers of serials requires the best efforts of the librarian, the programmer, and the computer to bring some semblance of order to the publishers' bibliographical world. Since we cannot, however, unscramble the publishers, we will have to sacrifice librarians and programmers.

There is not much that the librarian can do about erratically published journals, arbitrarily combined issues, whimsically numbered issues, or capricious title changes. Unfortunately, the computer cannot do much about these things either, but it can keep track of them and maintain order with a little less chaos than the humans have done. Perhaps someday all of the publishers will automate their processes, and then the millennium will have arrived—at least for computer manufacturers. In the meantime, librarians and computer programmers working and communing in the joys of togetherness can do much to develop and to maintain a serials world slightly short of the millennium.

It, too, however, will be chaotic, for in addition to the contributions of serials to the confusion, the computer will add its own. When serials and computers are thrown together the maxim can only be, "If anything can go wrong, it will!" The computer and its operator can contribute to the disorder just as well as the publisher. The computer that refuses to read tape 2, but will happily read tape 1 all over again, the operator who puts the paper in the printer backwards, and the operator who disregards console messages are all examples. All of these contribute to a normal serials atmosphere—a sort of organized chaos. We must conclude, therefore, that the computer will bring us *automated* organized chaos.

In spite of all the problems, however, the computer has long since proven itself to be an instrument of vast potential for library service, and through concentrated effort that potential can be unlocked. Some librarians and some computer people have already expended much effort in the development of automated serials systems, but to date, as fine as many of the efforts are, they, like the computers they use, are only in the horse and buggy stage of automation. What the future holds no one can be sure, but without a doubt much greater sophistication in input methods and in mass data storage will be among the first improvements necessary before the automation of serials can be considered a problem solved.

Very few libraries have developed a major serials automation program and most of those that presently operate machine systems are small libraries. A few important reseach libraries, perhaps half a dozen, have made significant advances in serials automation. The vast majority of libraries are waiting for someone else to solve the problems. While this is understandable, it is not very constructive. The problems of serials, automated or otherwise, require the total effort of the library world and not just that of a few brave and steadfast souls who are strongly motivated toward research. This reluctance to become involved has resulted in very spotty automated serials developments across the country.

Since most publishers cannot or will not make an effort to correct the bibliographical wrongs of their colleagues, perhaps the united efforts of librarians can persuade the recalcitrant and indifferent publishers to accept at least the national standards for periodical format (USASI Z39.1-1967)[1] and the internationally used identifying code, CODEN.[2]

In the meantime, those librarians interested in improving their serials procedures and services will have to continue struggling on their own. Many of them have attempted to alleviate some of the problems through the production of serials book catalogs. These have extended from lists of an individual library's holdings to state-wide union catalogs. Most of the state-wide catalogs have been limited to certain types of libraries, such as academic, medical, etc. A few state union catalogs are exactly that and include all types of libraries. Few, if any, of the book catalogs have actually supplanted previously existing card catalogs. This then means that these libraries are supporting duplicate systems of serials data display and, at least economically, defeating the purpose of the book catalog.

The production of book catalogs ranges in complexity from keypunch-and-print through computer-compiled holdings statements. In quantity of data, they extend from simple title-finding lists to comprehensive catalogs of historical data presented in the tradition of the *Union List of Serials.*

Some libraries have attempted to solve their serials problems in the accounting area. These libraries have set up subscription systems that maintain the budget, produce historical subscription records, and print out renewal lists on demand. Other libraries have courageously squared off with the major dragon and devised check-in systems. These range from simple systems (keypunch a card when an issue arrives) to check-in by cathode ray tube (CRT) consoles (see Figure 1).

Automated serials systems include four main functions: acquisitions and fiscal, check-in, display, and public service. In manual systems, display is considered either as an aspect of check-in or as a public service depending on the library concerned, but in automated systems, display is greatly emphasized because of the special production efforts necessary to create the display device—at the present time, usually a book catalog. Public services will not be discussed; however, this area would include such activities as automatic indexing, selective dissemination of information (SDI), abstracting, KWIC and KWOC indexes, circulation, etc. For our purposes, then, we will be concerned with three of the four main functions: acquisitions and fiscal, check-in, and display.

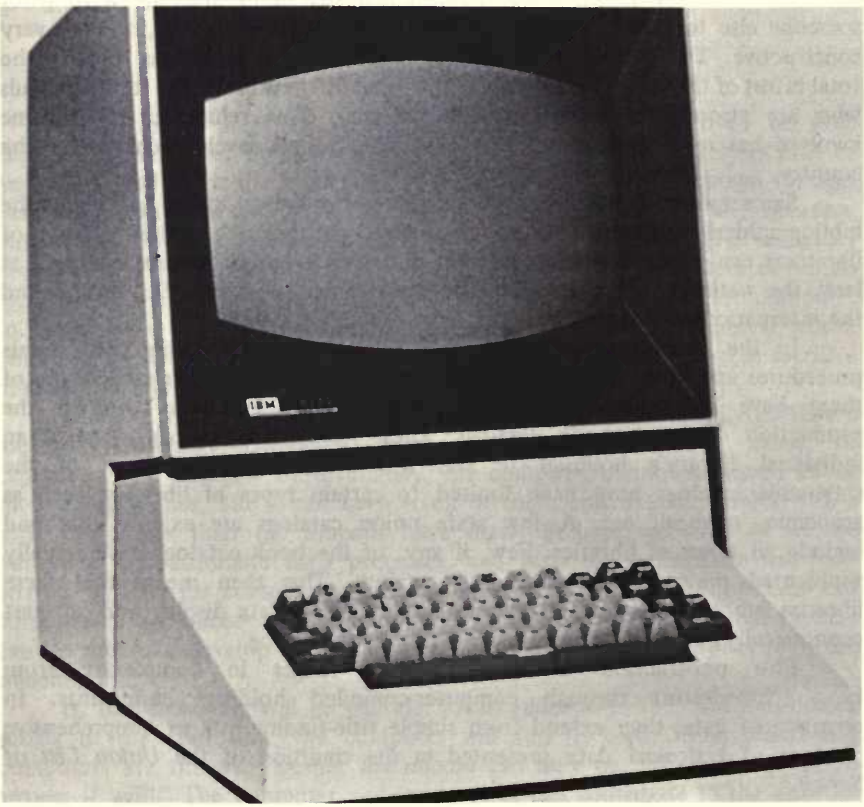


Figure 1. Cathode Ray Tube Console

When a large library decides to develop an automated serials system, it is essential that the administration understands that it is about to embark on a major expenditure of library resources, both financial and personnel. Hopefully, the administration realizes that the project will be a long-term one–extending over at least several years–and provision should be made accordingly. If the administration is not willing to allot sufficient funds for the methodical and well-organized development of a system, it should not become involved in systems development at all. At most it should choose to mechanize a facet of serials operations that it is willing to finance, and then be satisfied with that. If the administration honestly intends to automate serials operations, the library's needs should be determined and then supported to the fullest extent. Anything less in the end will net failure and embarrassment.

The development of an automated serials system requires extensive planning by trained personnel concerned with that alone. It requires a team of full time, experienced computer programmers supervised by a systems analyst, and, if the library does not have its own equipment, it requires the active interest and support of those who control the machines. In contrast to those fundamental and rather obvious requirements, some library administrations have attempted serials systems development by using their regular serials staff to plan the system and by hiring student programmers to carry out the programming function. Since "slave labor" has been used for both functions, the administrator ends up with a comparatively inexpensive failure.

It seems obvious that the development of a highly technical and intricate system would necessitate the employment of a team of trained and experienced personnel who are assigned solely to that project. In spite of that axiom, more systems fail or fall short of expectations because of inadequate personnel than from any other single factor. The administration simply cannot skimp on these new systems–there is no such thing as fire-sale automation.

For those reasons, an administration that seriously intends to automate serials procedures should expect to hire a professional systems analyst or at least a computer programmer well experienced in analysis. In addition, he should hire a corps of programmers that is large enough so that the loss of one or two members will not impair or wipe out the entire project. One of the most knowledgeable librarians on the staff should be relieved of all other tasks and assigned to the automation project full time to look after the library's interests. He should serve as the liaison between the project personnel and the library staff. He should be deeply involved in all of the system planning and should be sufficiently trained in systems analysis, data processing, and computer programming so that he can communicate with the analyst and programmers and understand their problems and difficulties.

This is the minimum professional personnel needed to successfully complete a serials automation system and anything less than this will result in failure or, with luck, a long drawn out project that spans a period of many years and ends with a mediocre system.

A second important area in which serials systems can easily fall short is that of planning. After creating the planning team which consists of a serials librarian and a systems analyst or at least a good programmer with experience in analysis, the proposed system must be planned. Good planning and documentation can be the difference between success and failure. If there is any chance that the library may want to automate all of its serials routines in the foreseeable future, then a complete system should be planned immediately. The entire system need not be implemented at one time, but the planning should be comprehensive enough so that nothing will be missed that could later necessitate extensive revision of the operating system. As an example, nothing is more disconcerting, to put it mildly, than to set up a check-in system and then later because of poor planning, to realize that no way was provided to determine which set of a certain serial is the subscription and which set is the gift so that the proper claim form can be sent out for missing items.

The planning should include interviews with the supervisors in the serials unit, but, even more important, exhaustive and critical inquiries with the clerical personnel into all of their daily routines must take place. These interviews should be held in a friendly and confidential atmosphere and should be intended to determine as precisely as possible how the various routines are carried out. The word "why" should be the question asked immediately after the "how" is answered. These routines should be documented and flow charted so that the work flow and work loads can be studied. Particular attention needs to be centered on the information necessary to trigger each action as these data will have to be available to the computer so that it can later make the correct decisions necessary to the operation of the machine system. Check-backs should be made frequently with the clerks working in the manual system so that accuracy is insured.

After the systems staff has a thorough understanding of the library's serials routines and of all their ramifications, the planning and the programming of the new system can begin. This usually includes the system flow charts and any necessary documentation, a time schedule for completion of various phases of the project, data preparation instruction manuals, program logic charts, etc. The documentation should be detailed enough so that a trained new person can take over the system development and/or operation completely after no more than a few days or weeks of study, depending on the complexity of the system.

The final major problem area in the adoption of a machine system is that of conversion to the new system. Briefly, this includes decisions on what phase of the new system should be converted first, establishing schedules for the change-over of the various phases, personnel orientation, completion of record conversion, determining operating procedures and completing documentation, parallel operations, etc. All of these factors apply in varying degrees to the installation of an automated serials systems.

Now that the background material concerning the development of a serials system has been briefly discussed, actual systems and their methods of operation can be examined for the major phases of an automated serials system: acquisitions and fiscal, check-in, and display. Each of these will be discussed in some detail and a few of the current methods of operations described.

The acquisitions and fiscal function usually include accounting, subscription renewal, subscription records (historical), and at least some aspects of budget control. In most libraries that have automated fiscal operations at the present time, data input is by punched card or by paper tape, but there are a few libraries that have sophisticated on-line systems, and typewriter or cathode ray tube (CRT) consoles are used. Other libraries use equipment that is off-line, but the data are transcribed directly onto magnetic tape or disc.

There is a large variety of input machines presently available on the market, and although we can discuss only a few of them, we can get a good idea of the types of equipment that are in use in libraries today. An IBM 026 keypunch is the usual method of input and by far the least expensive. When a keypunch is used, the data punched usually must be verified. This error-correcting routine requires an additional machine, a verifier, that resembles the keypunch and requires about the same amount of effort to operate. A variation of the keypunch theme is the IBM 826 typewriter-keypunch. This machine enables a clerk to type an order almost as she would on any typewriter and, as the typing takes place, the keypunch automatically produces the punched cards needed as computer input. For example, when the serial title, order number, and estimated price are typed on the order form, those data are simultaneously punched into cards. The information is then entered into the fiscal system when the cards are read by the computer. A paper tape typewriter is another of the less expensive input methods, but requires access to a computer configuration that includes a paper tape reader. A more sophisticated system of input is that of an IBM 1050 on-line typewriter terminal which enters data immediately and directly into some sort of computer storage. The most sophisticated system is that of a CRT console which operates on-line and is by far the best method for data updating. An additional method for input is the use of tape inscribers such as the Mohawk Data Recorder which, in off-line mode, records data directly onto magnetic tape.

After the data are converted to machine-readable form, the order form must be produced. Again, there are a variety of ways for doing this and they depend on the input method used. As was pointed out before, the IBM 826 typewriter-keypunch produces the order form immediately by typing. If a paper tape typewriter is used, the tape is read by the tape reader and a computer produces the order form, although it, too, can produce the order form by typing as the tape is punched. If a keypunch alone is used, the order form can be produced by reading the punched cards on an IBM 407 accounting machine which will then print the order form, or by reading the punched data on an IBM 870 document writer which will then automatically type the form. In large library situations, the order is produced by reading the card data on a computer and, as a by-product of that input function, having the computer print the order form. The computer printer produces the order form when either the IBM 1050 or the CRT console is used.

In any event, at this point the fiscal data are read into the data file and processing begins. Such data as identification number, title, date of order, estimated price, vendor, fund number, and order number are some of the elements picked up at this time. Later, after the cataloging has been completed and as subscription payments are made, additional data elements are entered into the system. These data make the production of many different kinds of output possible.

The most basic report is the budget statement that records the expenditures, encumbrances, and free balances of the library's various funds. Another primary output is the transaction report that shows each transaction that has taken place in a given fund over a certain period of time. Such a report not only includes obvious transactions, such as new encumbrances, payments, and adjusted free balances, but it also includes changes in allotments, transferals from fund to fund, and error corrections.

The report that is of most use to the serials staff is the subscription historical record. This report includes the complete record of past acitivity for each subscription. It is primarily used to prevent duplicate invoice payments by comparing dealers' or publishers' invoices with the data given on the printout. The important data elements usually supplied by the printout include entry, date of previous payments, amounts, invoice numbers, fund, source, periods of time or items paid for, and special symbols indicating added charges or multi-year payments. The symbol for added charges is included in the data so that in forecasting future costs the computer will add such charges to the year's subscription payments and not regard the added charge itself as a year's subscription. The multi-year payments are flagged as two- or three-year payments so the computer, when forecasting future budgetary needs, will charge the full amount to the correct future year and not handle the payment as an annual one. When determining average annual subscription costs, the computer will divide the multi-year payments by the number of years involved.

This historical data file enables a library to provide many worthwhile informational services. It can forecast future subscription costs based on past price activity. It can provide its branches, departmental libraries,etc., with lists of their subscriptions before renewal time, it can supply summaries of subscription costs by subject area, fund, dealer, etc., and it can produce lists of subscriptions to be renewed, if the library does not place "until forbid" subscriptions. It is obvious then that an automated acquisitions and fiscal system can provide much more than accounting data only and that it can be of great help to the administrator in his daily activity and in his planning.

The second function of a serials automated system is that of check-in. In large libraries operating under a manual system, this function is the one most in danger of hopeless disorder. It is a jumble of senseless complexity and needless frustration. A little forethought on the part of publishers could prevent a tremendous amount of difficulty for libraries and their patrons at no cost to the publishers. A simple and orderly numbering system for a serial can be adopted just as easily as a complicated, inconsistent, or muddle-headed one. A title can usually be changed just as well at the end of a volume as in the middle, and consistency in frequency of issue should not be a difficult goal to achieve. These are things that serials publishers should conform to—even down to the irresponsible and poverty-stricken "little magazines." At least they should *try* to cooperate. Since it is apparent that they will not concern themselves with library problems, libraries will have to cope with the problems themselves. Automation, it appears, is the only answer.

Since the check-in phase is the most difficult of all serials activity to control, many ways have been devised to handle it on a computer. All of them have merit, but some are more meritorious than others.

A good automated check-in system should achieve at least the following goals: 1) provide efficient inexpensive over-all control of serials receipts, 2) provide rapid check-in, 3) provide efficient and dependable retrieval of holdings information, and 4) comprise a simple operating procedure.

No check-in system, including a manual one, can meet all of these requirements. I personally consider the cathode ray tube as the most satisfactory method by far. It is, unfortunately, also the most expensive, but the results gained far surpass those gained from any other system.

Most of the automated check-in systems now operational are based on the arrival card system. This procedure was devised at the University of California at San Diego, La Jolla, in 1961.[3] Under the direction of Melvin Voigt, La Jolla was the first institution to develop a computer-based check-in system. The arrival card system is based on the prediction that a certain issue or volume of a serial will arrive in the library at an approximate date. A Hollerith card is punched by the computer in anticipation of the arrival of the next issue of each serial. (Figure 2A is an example of an arrival card.) As each issue arrives in the library, the correct card is manually pulled from the file, and after machine sorting, it is read by the computer and the record of each serial is updated. At the end of a given period, those cards remaining in the file represent issues expected, but not received. Claim forms can then be typed and mailed to the source from which the serial is received. Systems that are a little more sophisticated will produce the claims automatically when the remainder of the arrival cards are read by the computer. More advanced systems will produce the claims automatically without the use of the remaining cards and will also keep tabs on the activity of each serial so that notification will be made for serials that cease arriving altogether.

A considerable number of by-products can be had from a check-in system. For example, the computer can be programmed so that it will keep a tally of the issues received for each serial that is regularly bound. When a binding volume is complete, a binder's slip can be automatically produced along with a punched card. The slip, of course, is sent to the bindery with the issues, and the card is returned to the computer when the volume is bound so the machine record will be updated accordingly.

A variation on this idea is the system used by the San Francisco Public Library.[4] The binding card is not a punched card in that system, but a computer printed one; therefore, the serials holdings record cannot be updated automatically by returning the card to the computer when the binding routine is completed. Instead the necessary data must be keypunched as a separate operation. Nevertheless, the computer system does produce the signal that notifies the library staff that a particular serial volume is ready for binding. In addition, many instructions and informational notes are printed on the card.

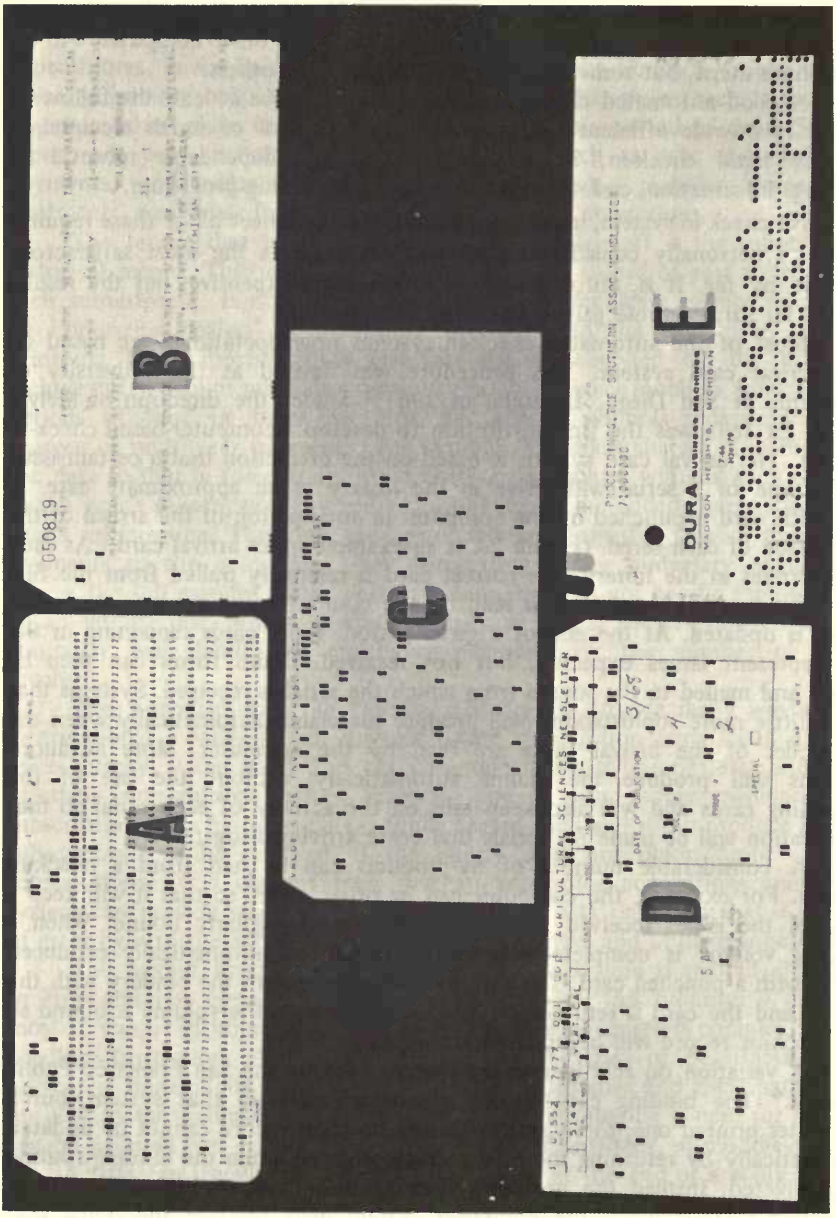


Figure 2. (A-E).

These cards are then used to retrieve the unbound issues from the library shelves, and the issues are then processed according to the data given on the card.

Other by-products that can be provided by a serials system are routing slips for journals circulated among staff members, receipt notices for staff members who are to be notified when new issues of serials that are of special interest to them arrive in the library, lists by branch or departmental library of serials received within some certain period of time, and lists for the circulation desks of volumes at the bindery.

In spite of its many excellent advantages, the arrival card system has several very important disadvantages. Among these are: 1) the limitations of the arrival card itself, 2) the need for unit record equipment in addition to dependable computer time, 3) the need for constant "nursing" of the control codes used to forecast arrival times and used for other functions, and 4) the human error element which is of even greater significance than in a manual situation. Each of these will be discussed in detail as follows.

When a system is designed, sufficient columns on the card must be provided for "housekeeping" codes and for other necessary data. There are then usually about thirty or thirty-five columns available for entry—not nearly enough for many journal titles and particularly not satisfactory for corporate entries. The entries are, therefore, abbreviated and the check-in clerks are often faced with the problem of correct identification of a card during the check-in procedure. Libraries that have operated this type of system have devised many different ways to eliminate this problem. Some libraries partially solve the problem by using an interpreter that can print multiple lines of data on a card. Other libraries eliminate the entry from the card altogether and provide the serial's identification number in its place. Usually, in such systems, the clerk checks or circles on a printout the issue number of the new arrival and the arrival card is pulled by the identification number at the end of the day. This procedure is now being used at La Jolla in their revised system.[3]

A variation on that theme is used by the San Francisco Public Library through the use of a prenumbered IBM card.[4] In this system, each arrival card has a six digit "I.D." number preprinted and prepunched. (Figure 2B is an example of this type of card.) The cards are continuous form and are bought in numbered batches. The computer associates each serial record in the data bank with one of the card numbers. The number of each record is the only datum punched in the arrival card, but up to 2,000 characters, including the full entry and the expected volume and issue number, can be printed on the card. The cards are arranged alphabetically by entry, and are manually pulled from the file when the corresponding issue arrives in the library. The computer reads only the punched number and then updates the data file according to the volume and/or issue numbers it previously associated with that identification number. If an issue arrives for which no card is present in the file, or if the predicted data are incorrect on a card, a special form is manually filled out and the new or corrected data are later keypunched. The library averages 16 percent of such situations daily, and an average of 204 issues are checked in per day.

Another way to get around the arrival card's limitations is to eliminate that card completely and to use a printout in its place. That, however, is a complete system in its own right and will be discussed later.

A further problem caused by the lack of space on the arrival card is the impossibility to provide the check-in clerks with the improvised instructions and notes that they often record for their own use in a manual check-in file. These items include such things as "informal" cross references, discard instructions, notes concerning odd frequencies, etc. By depriving the clerks of these "crutches" their production can be affected negatively until they find a substitute.

Figure 2C shows an example of a "pseudo-arrival card" that enables the clerks to have any data they want in the system without interfering with its operation. The card contains the I.D. number (not printed on it) of the serial, the entry printed, and the clerk's note printed. The card can then be sorted and merged by machine, but it remains in the arrival file and is never read by the computer. So that it can visibly be distinguished, it is useful to use a colored card. Of course, if the printout system or the prenumbered, prepunched card system is used, this problem does not exist.

The second disadvantage of the arrival card method that was mentioned above, i.e., the need for unit record equipment, forces the large library into rental costs for machines that would probably be used very little unless automated routines in addition to the serials one are run by the library. Arrival card systems usually must have available three unit record machines—a sorter, a collator, and an interpreter, and perhaps a fourth—an IBM 407 accounting machine. Among other things, the sorter is used to sort into various orders the cards representing the serials received on a given day. If an alphabetical list by entry of the day's receipts is wanted or lists of the various departmental or branch libraries' receipts, the arrival card must be sorted accordingly. If such lists are wanted, an IBM 407 is necessary for printing purposes, otherwise that machine is not needed. If sufficient funds are available for daily computer time, the sorter and the 407 are, of course, not necessary at all since their functions can be carried out on a computer.

The collator is used to merge each newly punched group of arrival cards into the arrival file. In small libraries, the entire arrival file can be taken to the machine, thus a machine can be used that is in another location and rented by another department or agency. In libraries with a large active file, this is impossible.

The interpreter prints the information necessary for clerical check-in purposes on the newly punched arrival cards. Because of price changes and varying models, it is difficult to give a cost figure for these machines, but a reasonable total rental figure would range around $800.00 per month—about $500.00 of which is for the 407.

The third disadvantage of the arrival card system is the need for constant "nursing" of the control codes as well as other codes. These codes are not needed in manual systems, but are essential to machine systems. For example, they include codes that represent the many numbering patterns used with serials, codes that symbolize the frequency of serials, codes used to compose holdings statements, and codes used to describe the way in which indexes, title pages, and tables of contents are issued. Such codes can easily number over a hundred. In addition to the usual number of bibliographical changes in serials, the clerks have to cope with the constant changes in codes necessary with a machine system. This problem is not unique with the arrival card operation, but there are other machine systems that permit much easier updating of these housekeeping codes–on-line systems for example.

As far as the fourth arrival card disadvantage–the human error element–there are many more opportunities to "foul up" the operation under an arrival card system than there are otherwise. If only the errors are considered that can be made in the assignment and re-assignment of the internal codes necessary to operate these systems, it is obvious that the error possibilities are fabulous! These codes will be discussed in some detail subsequently.

A method of check-in that is an improvement in many ways over the arrival card procedure is the print-out system. Instead of producing the punched arrival card, the data necessary to perform the check-in function are printed out. The check-in clerk then circles or checks the correct issue number that is printed on the form. At the end of the day, the pertinent data are keypunched, or converted in whatever way is used, and the converted data are read by the computer to up-date the files.

The advantages to this system are many. For example, it eliminates all filing and card sorting; complete information about each serial can be given on the printout, including full entry, dates of past issue arrivals, claim history, etc.; the check-in clerks can write notes on the printout for later punching as problems arise; and cross references can be provided.

On the negative side, it can be argued that in a large library a lot of keypunching and verifying must be done daily. This, however, is not as serious a problem as it may seem if the punching is kept current because only the identification number, the set or copy number, the volume and/or issue number, and some housekeeping codes need be punched for each item. The work involved is no more than is necessary in an on-line mode.

It should be pointed out that this particular problem is solved (depending on the quality of the forecasting) by the La Jolla system of using the arrival card with only the I.D. number printed on it.[3] All the data needed by the computer to update the data record have been previously punched into the arrival card by the computer.

Another means to reduce the amount of daily keypunching that is necessary with the print-out method has been devised by the System Development Corporation. It is a sort of "reverse" scheme. The serials check-in portion of their LISTS system (Library Information System Time-Sharing) uses the print out method for check-in, but the serials listed on the printout are divided into two groups and printed in adjacent columns. One column includes those serials whose arrival can be predicted reasonably well, and the other column includes serials whose arrival cannot be predicted very reliably. The check-in clerk checks the numbers of the issues actually received for both groups, but those issue numbers checked are the input for the *unpredictable* group *only.* In the case of the predictable group, the issue numbers of those *not* received are the input.

This system will require very accurate forecasting for the predictable group of serials. Unless unerring forecasting is done, many claims will be made for items that arrive shortly after the claim is issued. Few serials are so dependable that their absence means they will not soon be received! Another disadvantage to this system is that failure to punch an item in the predictable group will automatically result in the incorrect check-in of that issue since the computer assumes that the numbers not punched have been received.

The system is not yet operational at the time of this writing; therefore, its effectiveness has yet to be proven. The accurate forecasting required has, however, been difficult in all other systems operated to date.

One of the major problems with all of these check-in systems, except for the CRT method, is that they require a rather exact knowledge of the publishing frequency and the numbering system of each serial. It is necessary to possess this information in order to limit the number of arrival cards on hand at any one time (or issue numbers in the case of the check-in printout) by predicting the time of arrival of each issue. Also, the frequency and numbering system needs to be known in order to provide the correct volume and issue numbers of the items expected. In short, the idea is to have the right card at the right place at the right time.

Since predicting anything in serials control is, like the stock market and horse racing, at best a very precarious business, these predictions are frequently wrong. Because of the changeability of serials, the elaborate codes assigned to each serial to identify the frequency and the numbering system must often be corrected. When a CRT is used, no forecasting is necessary because no physical files exist; hence, there is no space problem, and no numbering system codes are needed because the computer will not produce a record showing the next expected issue. The computer will show the issues already received on the CRT, and the check-in clerk will decide what issue should have been received in relation to the information on the screen and the issue at hand. She can then make any necessary changes on the CRT by keying in the correct data.

The codes that are required for arrival card or printout check-in are quite extensive. In the April 1965 issue of *American Documentation,* Bishop, Milner, and Roper published an article[5] that provides among other things, a good insight into some of the problems involved in this forecasting. In that article the authors identified twenty-six different numbering systems used by publishers. There are about the same number of frequency patterns in use. Later, in the October 1969 issue of the same journal, it was announced that through "revision and combination" the numbering systems had been reduced to eighteen different ones.[6] Regardless of which number is correct, assuming either is, the variety and instability of serials numbering patterns makes the operation of any automatic system very difficult.

One of the most used systems of coding frequency patterns is the one developed at Washington University of St. Louis, School of Medicine Library, under the direction of Estelle Brodman.[7] If a serial about to be entered into the system publishes in January, April, July, September, and October, a digit "1" is placed on a form under each of those months. A zero is placed under the remaining months. This then provides a three digit number for each quarter of the year: 100, 100, 101, 100. In order to reduce these codes to a single digit as a space saving measure, the codes are compared with a "Coding Chart" which gives single digit equivalencies for all possible three digit codes. Using the example above, 100 = 4 and 101 = 5. The frequency code which tells the computer to punch an arrival card for each of the above months at the appropriate time then is 4 4 5 4. Variations of this theme are used for weekly, semi-monthly, and other frequencies.

The system used at the New York State Library includes a "lag factor" which is calculated on the lag between the publication date of an issue and the issue's actual arrival date. This method is an attempt to forecast an exact arrival date.

In addition to all of this, the computer must know the code representing the numbering system used by each serial in the file. These are usually simple two digit codes depicting the various systems, such as 01 = volume numbering continuous, issue numbering reverts to 1; 02 = volume numbering and issue numbering continuous; 03 = volume numbering continuous, issue designation by season, etc.

The computer must also know the numbering that it punched into the last arrival card, or printed on the check-in printout, so that it will know what numbering must be provided for the next issue expected. It must also know exactly when to revert to issue number 1 when that is required. There are innumerable other details included in the mechanics of these check-in systems, but this should provide a feeling for the complexities.

Some libraries, in small situations, have adopted a simple method that eliminates all of these problems, but it is not very "automated" and it is satisfactory only in small libraries. Figure 2D shows an arrival card that has all of the necessary information punched into it except the numbering data. These data are written on the card by the check-in clerk when an issue arrives in the library and then are later punched into the card. Large libraries could not very likely afford the time required to write the data on the card and also punch it.

A system that is an interesting variation on this theme is the one used at Miami-Dade Junior College Library, Miami, Florida.[8] At that library, a file of edge-punched cards readable by a paper tape typewriter is maintained. (Figure 2E shows an example of an edge-punched card.) When a new title is entered into the system, a card is automatically punched on the paper tape typewriter as the serial's title and I.D. number are typed on a gummed label. The label is then placed on the card for visual identification and filing purposes.

When a serial issue is checked in, the corresponding card is manually pulled from the file and read by the paper tape typewriter. This action punches the serial entry and I.D. number onto a paper tape. The issue date is then typed by the operator and thereby automatically punched onto the paper tape. The tape is later read by the computer and the data file updated. Since the issue numbering data is supplied after the issue arrives in the library, no forecasting is necessary.

This system is a unique and simple one, and without question does the job well for the small library that designed it. The biggest obvious disadvantage is the manual filing of the punched cards. Usually, the elimination of such files is one of the reasons for automating. The use of paper tape requires special equipment to read it, but on the other hand, it is faster to type on a paper tape typewriter than it is to operate a keypunch and a verifier.

For a small library, or even a medium-sized one, this appears to be an excellent system. It seems to have most aspects of serials control included in it and to be well planned.

A system of check-in that is now operational in a small library, but probably could be used without difficulty in a large situation is the one used at the Pennsylvania State University, Milton S. Hershey Medical Center at Hershey. This system uses an IBM 1050 typewriter terminal which, for check-in purposes, is off-line, and while off-line produces a punched paper tape. For visual verification purposes hard copy is also produced. As serial issues are received, the check-in clerk types the necessary identification and check-in data on the 1050 keyboard. After visual verification, the clerk directly connects the terminal with the IBM 360/67 computer at the main Pennsylvania State University campus 103 miles from Hershey. The paper tape is then read by a transmitter and the data are transmitted over telephone lines. The clerk calls in the computer programs which update the files and transfer the data to data cell storage. The storage file can also be accessed by the Hershey Medical Library.

This system gains some of the benefits of an on-line operation with something less than the high costs of that mode, and verification is easy since hard copy is supplied. In order to maintain consistently formated holdings statements, however, it would be necessary for the check-in clerk in a large library with many varied serials to go through a look-up process to determine how each holdings statement was formated previously in the system. Any library considering the adoption of an automated check-in system should, nevertheless, look into this method if the necessary hardware is accessible.

Hopefully, this discussion of the complications and shortcomings of these systems will not scare off librarians. All of these systems except the System Development Corporation one, are being successfully operated today in libraries. In spite of the problems, their advantages over the old manual methods are legion. When well designed, they operate in many ways at an efficiency level previously unknown, and generally they afford control over serials far superior to the old manual systems. In addition, they provide a variety of output methods and formats that the manual procedures cannot even hope to match. It should be kept in mind, however, that all of these methods are steppingstones toward the ultimate serials system. That system cannot exist until librarians and publishers work together to solve serials' bibliographical problems.

The third method of automated check-in available today is that of a cathode ray tube (CRT). Referring back to Figure 1, these consoles resemble a television screen with a typewriter keyboard attached. The use of this equipment increases the efficiency of the entire serials operation because the CRT can be used for all serials procedures, not just check-in. The use of the CRT for input and update serves as an excellent system. An even better system is one that uses the CRT console for input and for public output, but to make sufficient consoles available for staff and patron use would be an expensive operation–although certainly not an innovative one.

When a CRT console is used for check-in, each serial's I.D. number is the key to entrance into the data file. It is necessary to look up the I.D. number in a listings of such numbers. The check-in clerk then keys in the number and the record for the corresponding serial appears on the CRT screen. The clerk can then make whatever changes needed–the addition of an issue or volume number, the changing of a group of issue numbers into a volume number to indicate a bound volume, the changing of a title, the addition of a history note, the correction of a spelling error, the addition of a new record as a new subscription on order, etc. When she is finished entering the data, she visually verifies the record on the screen, and if no errors exist, presses the enter key which returns the record to storage. If errors exist, she immediately corrects them on the CRT screen and then enters the data into storage.

A system much like the one just described is now in operation at Laval University in Quebec. Three IBM 2260 consoles are used, and that library has 15,000 titles and 5,000 cross references operating on the system. It has been operational since June 1968, and according to Rosario de Varennes, Director of Library Automation, has been enthusiastically accepted by the staff.

A CRT is also being used for updating serials data (but not used for check-in purposes) at the University of California at Irvine. The system is called the Serials Graphic Record Management System (SEGREMS), and it was developed under the direction of Herbert Ahn.

If it is possible to get publishers and subcription agencies to cooperate with the library, much of the I.D. number look up can be eliminated in these systems by including the serials I.D. number on the mailing label as part of the library's address. The clerk then can read the number directly off the label and key it in on the console.

Another way to accomplish the same end would be through the use of CODEN.[9] If CODEN were assigned to all serials, and if publishers would follow the lead of the American Chemical Society and print the CODEN prominently on their publications, it could serve the same function.

The CRT system provides many advantages over all other methods. As mentioned before, it is more than a means of check-in–it is a complete data update and maintenance system. It eliminates all card handling, typing, filing, etc. The data is "typed," i.e., keyed in once and all other operations stem from that one input. If consoles are provided in various places throughout the library system, the staff and patrons can determine instantly the up-to-the-minute status of any serial in the collection.

There is one other method of check-in that has been devised, but it has not yet been used as anything other than an experiment. At Los Gatos, California, the IBM Advanced Systems Development Division Laboratory has developed a method of check-in using an IBM 2760 Optical Image Unit. Figure 3 is a picture of a 2760. This machine operates on-line in a conversational mode and provides input data to a computer through the use of a translucent screen and a light-sensitive probe. The screen is composed of 120 designated response points which when touched by the light-pen, i.e., the probe, transmit electrical impulses to the computer. The data that appears on the screen are projected from a sixteen millimeter filmstrip that is contained in a cartridge and is inserted by the operator into a slot on the machine. The filmstrip is moved frame by frame in either direction by instructions from the computer or manually by the operator.

Each filmstrip contains 128 frames usable for data. The filmstrips must be produced using standard animation techniques so that the images will be registered on the film in relation to the response points on the 2760 screen. The filmstrip contains a group of "decision frames" which enable the check-in clerk to "zero-in" on the serial title required and to choose the necessary input format for the numbering system used by that serial. The only data on the filmstrip that directly pertain to each serial included in the check-in system is the title or entry.

If the clerk is checking in volume 9, number 10 or *Jet Age Planning*, she first calls for a "spin index" of title first letters. When this alphabetical index appears on the screen, she touches, with the probe, the first letter or, to narrow the field, the first two letters, of the title or entry–in this case "JE." All titles beginning with the letters "JE" appear on the screen. She then calls for another spin index, and touches the initial letter or letters of the second important word in the entry she intends to update–in this case, "A" or "AG." She continues this process until the title she seeks appears on the screen. She then calls for the decision frame which contains all possible numbering system formats, such as, volume and issue, month and year, season, month-day-year, etc. She touches the format used by the serial to be checked-in and a "keyboard image" type frame appears on the screen. This frame contains the possible numbers or dates needed to check-in the serial concerned. She then completes the check-in by touching on the screen the correct numbers or dates for the issue at hand. If the issue so checked in is not the expected one, a report is automatically typed out on the attached typewriter terminal. The decision to claim or not can be made at a later time.

To date the system has been used only for experimental purposes so its practicality has yet to be proven. It is an interesting technique and certainly a different approach than any of the others. It deserves a trial in a library where it can be studied under fire.

The final serials function that we will discuss is display. This aspect of automated serials control can take several different forms, for example, card catalogs, book catalogs, printouts, on-line terminals, or microforms.

The production of catalog cards by computer is now rather commonplace, although it is done more often for monographs than for serials. Book catalogs and printouts are the usual machine methods used to display serials data by mechanized means. The book catalog has long since proven itself a versatile tool–easily distributed wherever needed, and easily used. If it

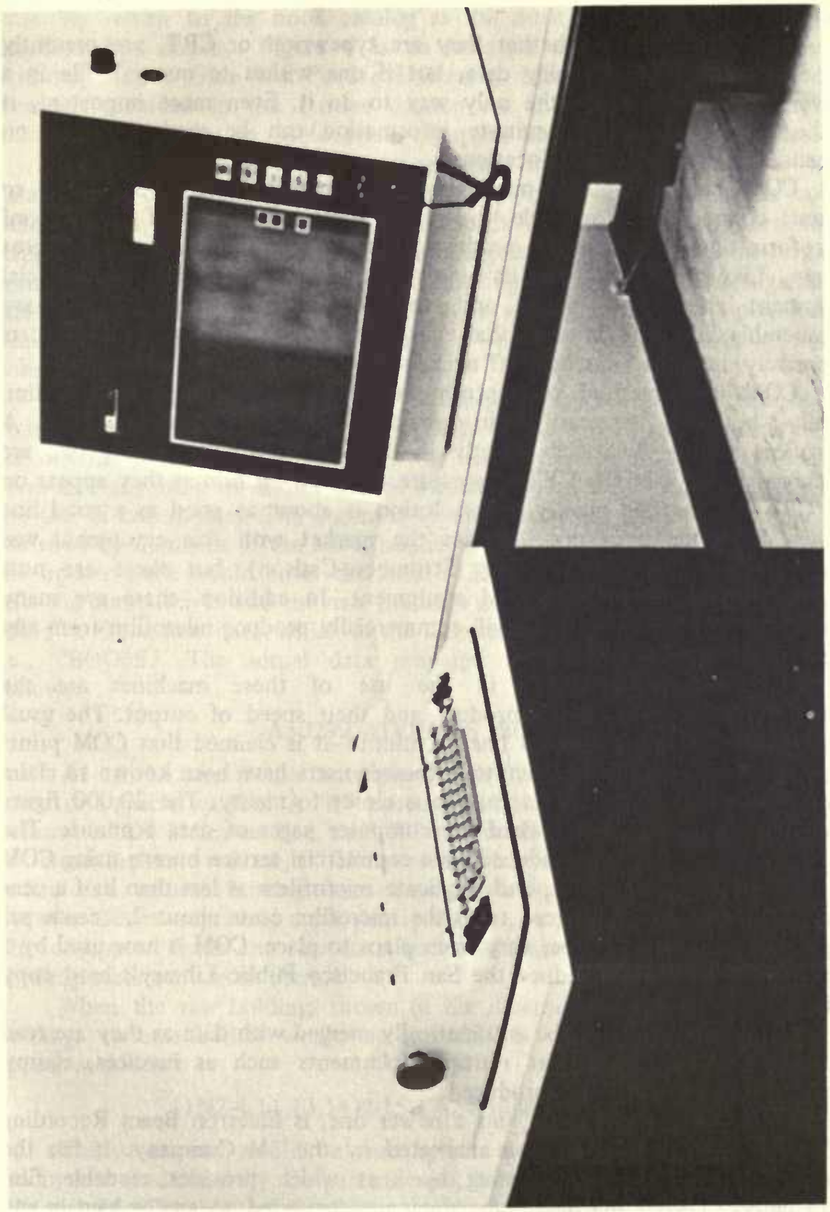


Figure 3. IBM 2760 Optical Image Unit

is simply produced, it can be frequently updated and readily replaced. It should be produced as an ephemeral document to be rapidly supplemented and soon discarded, since the data it contains is out-of-date when the mailman next arrives.

On-line terminals, whether they are typewriter or CRT, are presently the expensive way to display data, but if one wishes to query a file in a conversational mode it is the only way to do it. Even more important, it is the only way up-to-the-minute information can be made available on demand at multiple-retrieval locations.

COM, computer-output-microfilm, is the newest method of display to become commercially available.[10] It has all the advantages of any type of microform–inexpensiveness to produce, ease of reproduction, and low cost storage. Like any microform, its biggest disadvantage is the fact that special equipment is needed to read it, and even more important, most people have considerable difficulty in using that equipment. If one uses microform readers extensively, he soon joins the stiff neck, sore eyeballs club.

COM is a method of capturing computer output onto microfilm, usually, but not necessarily, through the use of cathode ray tubes. A microfilm camera is placed directly in line with a CRT, and the two are synchronized so that the CRT images are captured on film as they appear on the CRT screen. The quality of resolution is about as good as a good line printer. The first company to enter the market with this equipment was Stromberg Datagraphics (formerly Stromberg-Carlson), but there are now many companies marketing COM equipment. In addition, there are many service bureaus using COM that will commercially produce microfilm from any magnetic tape data file.

Among the advantages in the use of these machines are the inexpensiveness of their final product and their speed of output. The usual computer printer prints 1,100 lines a minute–it is claimed that COM prints 20,000 to 30,000 lines per minute, although users have been known to claim that 5,000 to 6,000 lines per minute is closer to reality. The 20,000 figure amounts to filming 300 standard-size computer pages of data a minute. The microfilm original can be produced by a commercial service bureau using COM at about 1.5 cents per page, and duplicate microfilms at less than half a cent per page. Hard copy produced from the microfilm costs about 2.5 cents per page. These costs, of course, vary from place to place. COM is now used by a commercial printer to produce the San Francisco Public Library's hard copy serials catalog.

Preprinted forms can be automatically merged with data as they are read from magnetic tape so that routine documents such as invoices, claims, overdue notices, etc., can be produced.

Another form of COM, and a newer one, is Electron Beam Recording (EBR). It was developed and is marketed by the 3M Company. It has the advantage of dry film processing by heat which provides readable film immediately. Digital magnetic tape data are converted to analog signals and those signals control an electron beam which "writes" the images onto Dry-Silver Microfilm.

Using either form of COM, a library can retain its computer output on microfilm and inexpensively produce as many duplicate films as needed, or offset masters can be made from the film and book catalogs produced.

To return to the book catalog as the most prevalent form of serials machine data display, Figure 4 is an example of a full-page three-column printout that is from the Purdue University Libraries' catalog.[11] The data elements included in the Purdue catalog are the entry, history notes, call number, library location, sublocation, compiled holdings, and special notes.

There are two ways to produce serials holdings statements for book catalogs: 1) compiled holdings statements, i.e., the computer reads coded holdings data, and then compiles the compact holdings statements from those data, and 2) by manually converting holdings statements to machine-readable form in a prescribed format, and then printing the catalog without significant change from the in-put format. This type is also known as "open-ended" because complete holdings are shown as 1- or 1+. Purdue's catalog is the compiled type.

Figure 5 is a sample of "raw" holdings data, i.e., holdings data before compilation. The printouts of raw holdings data are used by the library staff for internal purposes only. The data for each serial are printed out in matrix form and any item of datum can be located for updating or deletion through the use of coordinates. The columns of the matrix are labeled by letters and the rows by numbers. If the latest bound volume is to be added to the record, the update clerk would enter the serial's I.D. number, a code "ADDH" which tells the computer to add the new holdings data to the record, the coordinates "M5," and the new data, which in the illustration would be bound volume 65, i.e., "BOO65." The actual data prepared for keypunching would be as follows:

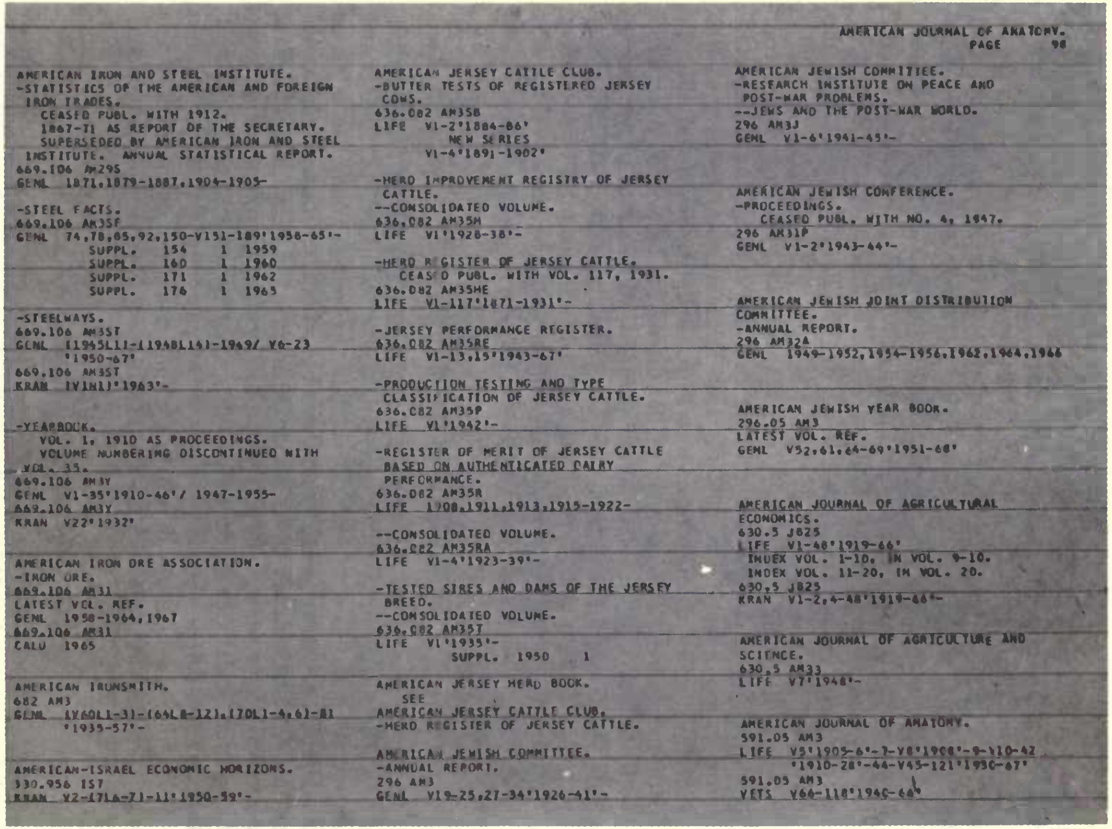
A50292 ADDH M5 /BOO65/

As can be seen in the illustration, each five-character word begins with a letter or a special symbol. A "B" represents a bound volume, a "U" an unbound volume, a "D" indicates date, and "X" is a bound duplicate volume, a "Y" is an unbound duplicate volume, a "K" is a volume bound out of sequence, and a "V" indicates a volume missing from a particular type of sequence. The data between slashes represent a physical piece, i.e., a physical volume or an issue. The computer reads the raw data and then compiles the familiar compact holdings statement from them.

When the raw holdings shown in the illustration are compiled into the holdings statement that would be included in the book catalog, it would appear as follows:

(1N2-4,11,13,14)2-15,17-24[1946-1955]25-64-

This statement would be read by the patron as follows: volume 1 is incomplete (indicated by the parentheses), but has numbers 2 through 4, 11, 13, and 14. The library also has volumes 2 through 15, but volume 16 is missing. It does have, however, volumes 17 through 24, and the dates, including volume 1, are 1946 through 1955. The library also has volumes 25



AMERICAN JOURNAL OF ANATOMY.
PAGE 98

AMERICAN IRON AND STEEL INSTITUTE.
-STATISTICS OF THE AMERICAN AND FOREIGN IRON TRADES.
CEASED PUBL. WITH 1912.
1867-71 AS REPORT OF THE SECRETARY.
SUPERSEDED BY AMERICAN IRON AND STEEL INSTITUTE. ANNUAL STATISTICAL REPORT.
669.106 AM29S
GENL 1871,1879-1887,1904-1905-

-STEEL FACTS.
669.106 AM35F
GENL 74,78,85,92,150-V151-189'1958-65'-
SUPPL. 154 1 1959
SUPPL. 160 1 1960
SUPPL. 171 1 1962
SUPPL. 176 1 1965

-STEELWAYS.
669.106 AM35T
GENL (1945L11-(1948L14)-1949/ V6-23
'1950-67'
669.106 AM35T
KRAN (V1N1)'1963'-

-YEARBOOK.
VOL. 1, 1910 AS PROCEEDINGS.
VOLUME NUMBERING DISCONTINUED WITH VOL. 35.
669.106 AM3Y
GENL V1-35'1910-46'/ 1947-1955-
669.106 AM3Y
KRAN V22'1932'

AMERICAN IRON ORE ASSOCIATION.
-IRON ORE.
669.106 AM31
LATEST VOL. REF.
GENL 1958-1964,1967
669.106 AM31
CALU 1965

AMERICAN IRONSMITH.
682 AM3
GENL (V60L1-3)-(64L8-12),(70L1-4,6)-81
'1935-57'-

AMERICAN-ISRAEL ECONOMIC HORIZONS.
330.956 IS7
KRAN V2-(71L6-7)-11'1950-59'-

AMERICAN JERSEY CATTLE CLUB.
-BUTTER TESTS OF REGISTERED JERSEY COWS.
636.082 AM35B
LIFE V1-2'1884-86'
NEW SERIES
V1-4'1891-1902'

-HERD IMPROVEMENT REGISTRY OF JERSEY CATTLE.
--CONSOLIDATED VOLUME.
636.082 AM35H
LIFE V1'1928-38'-

-HERD REGISTER OF JERSEY CATTLE.
CEASED PUBL. WITH VOL. 117, 1931.
636.082 AM35HE
LIFE V1-117'1871-1931'-

-JERSEY PERFORMANCE REGISTER.
636.082 AM35RE
LIFE V1-13,15'1943-67'

-PRODUCTION TESTING AND TYPE CLASSIFICATION OF JERSEY CATTLE.
636.082 AM35P
LIFE V1'1942'-

-REGISTER OF MERIT OF JERSEY CATTLE BASED ON AUTHENTICATED DAIRY PERFORMANCE.
636.082 AM35R
LIFE 1908,1911,1913,1915-1922-

--CONSOLIDATED VOLUME.
636.082 AM35RA
LIFE V1-4'1923-39'-

-TESTED SIRES AND DAMS OF THE JERSEY BREED.
--CONSOLIDATED VOLUME.
636.082 AM35T
LIFE V1'1935'-
SUPPL. 1950 1

AMERICAN JERSEY HERD BOOK.
SEE
AMERICAN JERSEY CATTLE CLUB.
-HERD REGISTER OF JERSEY CATTLE.

AMERICAN JEWISH COMMITTEE.
-ANNUAL REPORT.
296 AM3
GENL V19-25,27-34'1926-41'-

AMERICAN JEWISH COMMITTEE.
-RESEARCH INSTITUTE ON PEACE AND POST-WAR PROBLEMS.
--JEWS AND THE POST-WAR WORLD.
296 AM3J
GENL V1-6'1941-45'-

AMERICAN JEWISH CONFERENCE.
-PROCEEDINGS.
CEASED PUBL. WITH NO. 4, 1947.
296 AM31P
GENL V1-2'1943-44'-

AMERICAN JEWISH JOINT DISTRIBUTION COMMITTEE.
-ANNUAL REPORT.
296 AM32A
GENL 1949-1952,1954-1956,1962,1964,1966

AMERICAN JEWISH YEAR BOOK.
296.05 AM3
LATEST VOL. REF.
GENL V52,61,64-69'1951-68'

AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS.
630.5 J825
LIFE V1-48'1919-66'
INDEX VOL. 1-10, IN VOL. 9-10.
INDEX VOL. 11-20, IN VOL. 20.
630.5 J825
KRAN V1-2,4-48'1919-66'-

AMERICAN JOURNAL OF AGRICULTURE AND SCIENCE.
630.5 AM33
LIFE V7'1948'-

AMERICAN JOURNAL OF ANATOMY.
591.05 AM3
LIFE V5'1905-6'-7-V8'1908'-9-V10-42
'1910-28'-44-V45-121'1930-67'
591.05 AM3
VETS V66-118'1940-66'

Figure 4. Page from Purdue University Libraries' Catalog

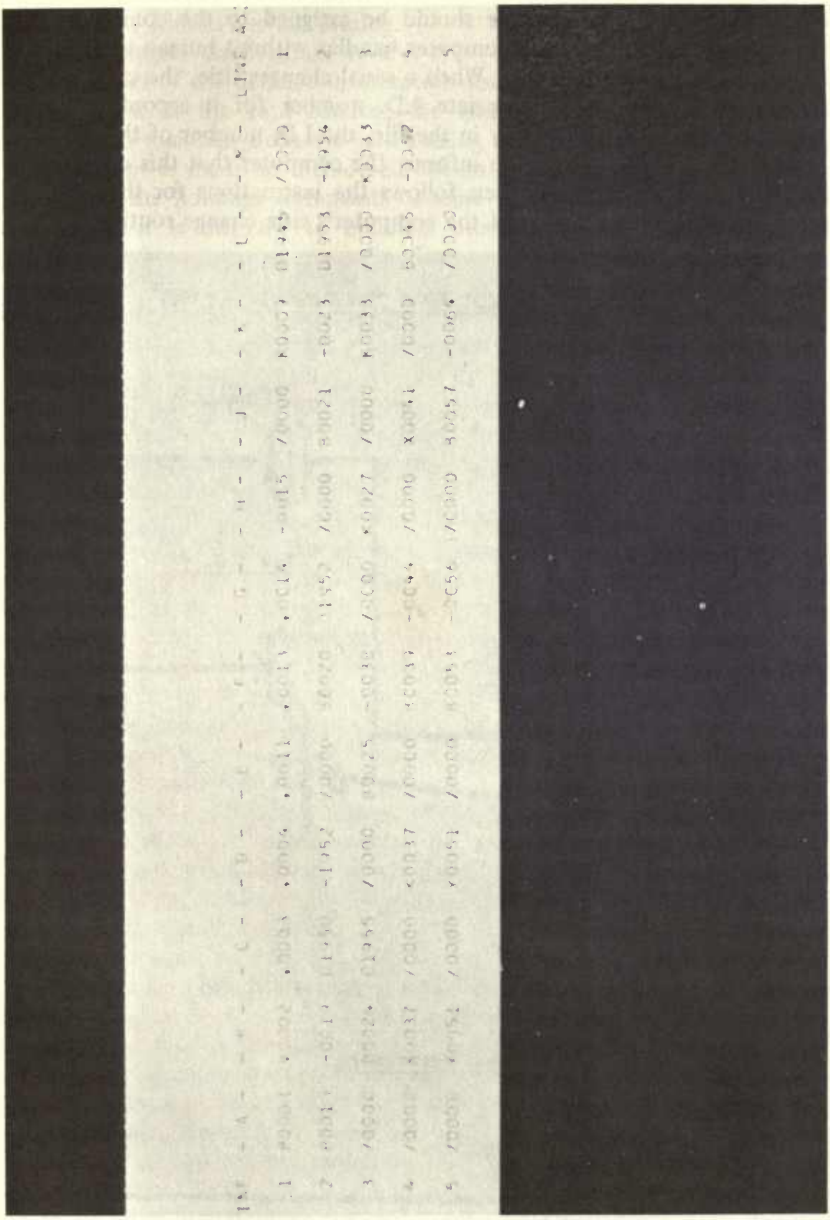


Figure 5. Sample of "Raw" Holdings Data

through 64, and is continuing to receive the serial (indicated by the dash at the end of the statement). The dates for those volumes are unknown.

If a system is developed to this extent, it follows that as much of the mundane maintenance as possible should be assigned to the computer. One aspect of maintenance that the computer handles without human intervention is the system of cross references. When a serial changes title, the update clerk enters the new title, the appropriate I.D. number for it according to the alphabetical postion it will occupy in the file, the I.D. number of the old title, and the code "TTOX." The code informs the computer that this operation is a title change. The computer then follows the instructions for that routine. Figure 6 is a schematic drawing of the computer's title change routine.

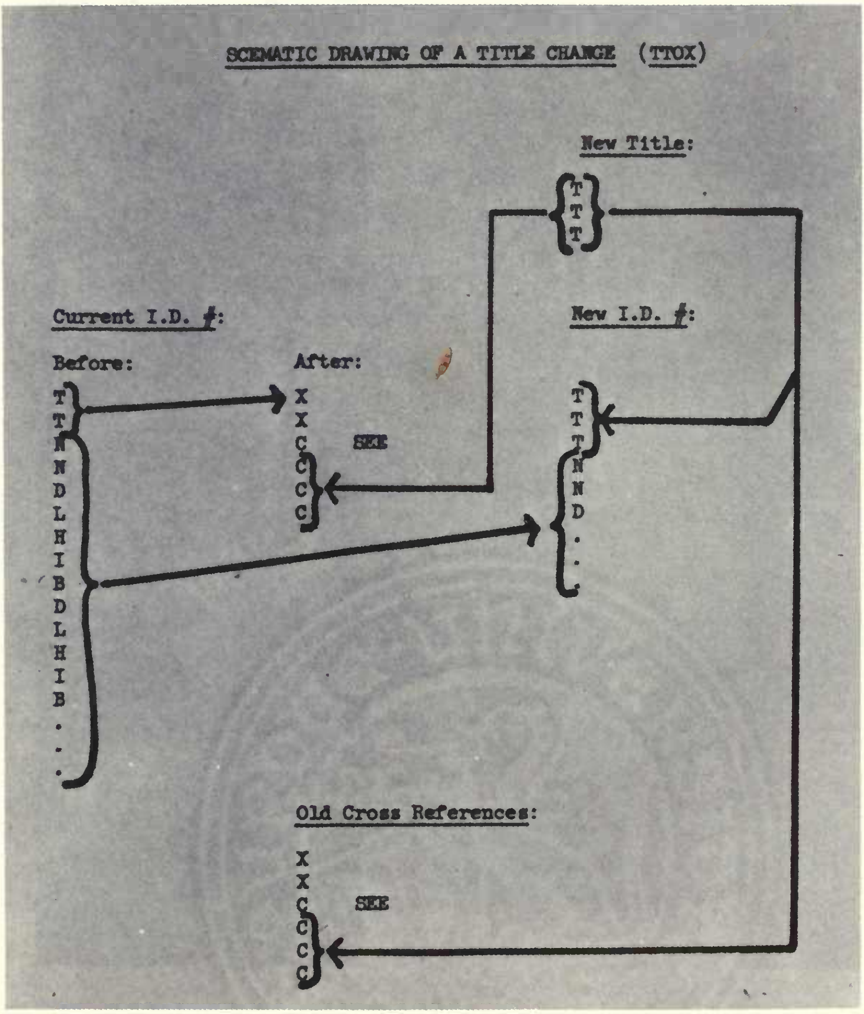


Figure 6.

Most serials catalogs are of the "convert and print" or the "open-ended" type because they are much more easily and, therefore, more inexpensively produced. Figure 7 is an example of this type and is a page from the University of Illinois's serials catalog.

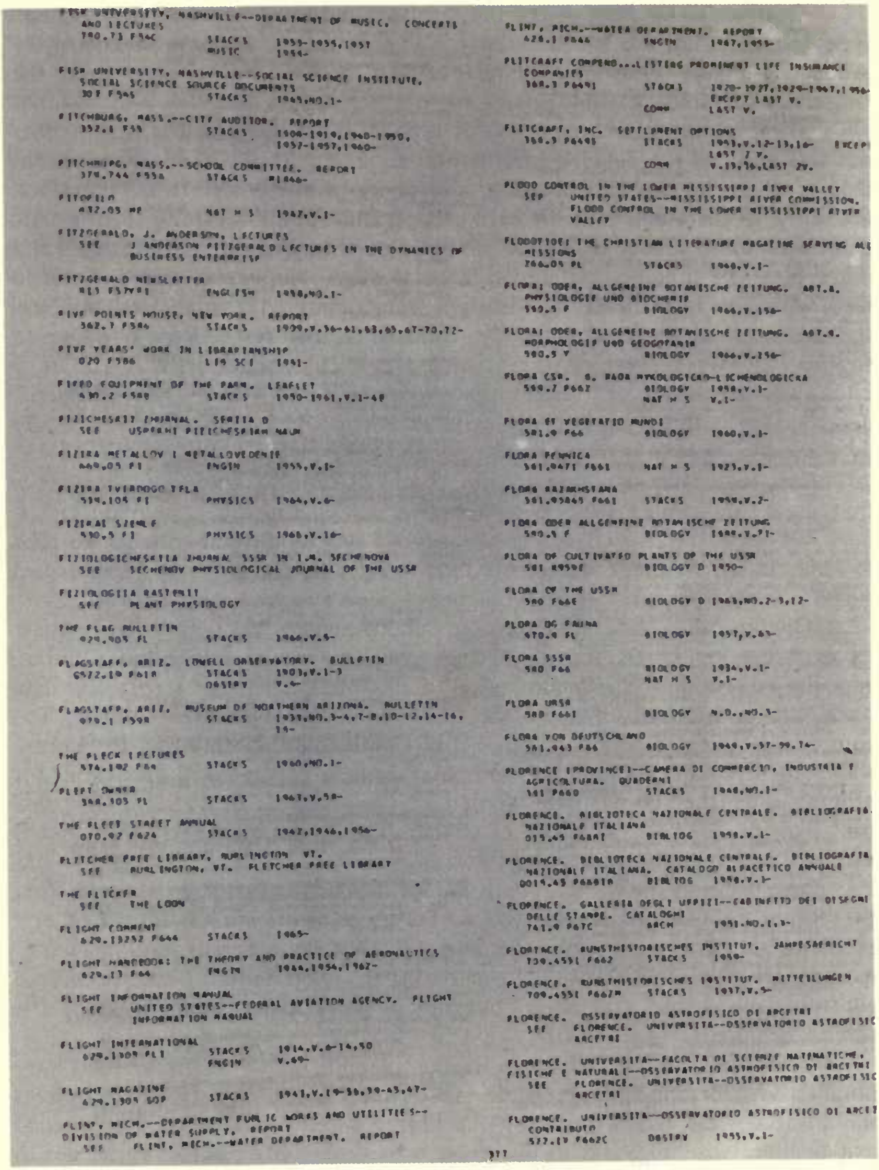
The biggest disadvantage to this type of holdings record is that it does not reflect all of the detailed information about the library's serials collections that is given in the card catalog, the check-in files, etc. It is, therefore, necessary to maintain both the card catalog and the book catalog indefinitely. If an attempt is made to include all the data that are in the card catalogs and other files, the holdings statements become very complicated and difficult to read. Also, it is difficult to maintain consistency in complicated holdings statements when prepared manually. Humans tend to forget from one time to another the way in which they handled previous situations, and also they interpret circumstances differently from time to time. An additional disadvantage is that such holdings statements cannot be updated automatically by a check-in system, except perhaps by the CRT method.

The major disadvantage to the compiled type of holdings statement is that the programming logic is complicated and, because it is complicated, it does not lend itself to change very easily. It also requires more machine time to compile the holdings statements than it does just to print the open-ended type.

On the other hand, the compiled catalog enables the library to eliminate its card catalog serials records and its check-in records of bound volumes, annuals, and other occasionally received materials, since the serials raw data bank can include all of the data that such records usually contain. The compiled holdings statements can be as simple or as involved as the library wants them to be because the computer can be programmed to choose for printing only the specific data wanted at a given time. In addition, the data bank can be used for all kinds of statistical and management studies, and is much more flexible for other uses.

The decision on which type to adopt depends on what is expected from the library's automated serials system. To arrive at the correct answer to that problem, detailed study and planning are necessary. Serials, by their very nature, are too obstreperous to allow snap judgements. Libraries should control their serials collection, but unless good management is used, the reverse is more likely to be true.

This, then, brings us back to the planning of a serials system. Any library, large or small, that decides to develop an automated serials system should study the whole problem—the library's needs and wants, its financial and technical backing, and its future growth probabilities before it decides in which direction to go. In addition, studies should be made of all types of serials systems operating in other libraries so that the best one is chosen. When the homework is well done, the library can proceed on whatever course it chooses, confident that it has every chance of success and will gain maximum advantage from its automated serials program.



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FISK UNIVERSITY, NASHVILLE--DEPARTMENT OF MUSIC.  CONCERTS
   AND LECTURES
   780.73 F54C            STACKS    1953-1955,1957
                          MUSIC     1954-

FISK UNIVERSITY, NASHVILLE--SOCIAL SCIENCE INSTITUTE.
   SOCIAL SCIENCE SOURCE DOCUMENTS
   301 F545               STACKS    1945,NO.1-

FITCHBURG, MASS.--CITY AUDITOR.  REPORT
   352.1 F55              STACKS    1904-1919,1940-1950,
                                    1952-1957,1960-

FITCHBURG, MASS.--SCHOOL COMMITTEE.  REPORT
   379.744 F55A           STACKS    *1846-

FITOFILO
   632.05 MF              NAT H S   1947,V.1-

FITZGERALD, J. ANDERSON, LECTURES
   SEE    J ANDERSON FITZGERALD LECTURES IN THE DYNAMICS OF
          BUSINESS ENTERPRISE

FITZGERALD NEWSLETTER
   813 F57Y81             ENGLISH   1958,NO.1-

FIVE POINTS HOUSE, NEW YORK.  REPORT
   362.7 F586             STACKS    1909,V.56-61,63,65,67-70,72-

FIVE YEARS' WORK IN LIBRARIANSHIP
   020 F586               LIB SCI   1951-

FIXED EQUIPMENT OF THE FARM.  LEAFLET
   630.2 F588             STACKS    1950-1961,V.1-48

FIZICHESKII ZHURNAL.  SERIIA D
   SEE    USPEKHI FIZICHESKIKH NAUK

FIZIKA METALLOV I METALLOVEDENIE
   669.05 FI              ENGIN     1955,V.1-

FIZIKA TVERDOGO TELA
   539.105 FI             PHYSICS   1964,V.6-

FIZIKAL SZEMLE
   530.5 FI               PHYSICS   1966,V.16-

FIZIOLOGICHESKII ZHURNAL SSSR IM I.M. SECHENOVA
   SEE    SECHENOV PHYSIOLOGICAL JOURNAL OF THE USSR

FIZIOLOGIIA RASTENII
   SEE    PLANT PHYSIOLOGY

THE FLAG BULLETIN
   929.905 FL             STACKS    1966,V.5-

FLAGSTAFF, ARIZ.  LOWELL OBSERVATORY.  BULLETIN
  6572.19 F618            STACKS    1903,V.1-3
                          OBSTRY    V.4-

FLAGSTAFF, ARIZ.  MUSEUM OF NORTHERN ARIZONA.  BULLETIN
   979.1 F598             STACKS    1931,NO.3-4,7-8,10-12,14-16,
                                    19-

THE FLECK LECTURES
   574.192 F59            STACKS    1960,NO.1-

FLEET OWNER
   388.305 FL             STACKS    1967,V.58-

THE FLEET STREET ANNUAL
   070.92 F624            STACKS    1942,1946,1956-

FLETCHER FREE LIBRARY, BURLINGTON  VT.
   SEE    BURLINGTON, VT.  FLETCHER FREE LIBRARY

THE FLICKER
   SEE    THE LOON

FLIGHT COMMENT
   629.13252 F644         STACKS    1965-

FLIGHT HANDBOOK: THE THEORY AND PRACTICE OF AERONAUTICS
   629.13 F64             ENGIN     1944,1954,1962-

FLIGHT INFORMATION MANUAL
   SEE    UNITED STATES--FEDERAL AVIATION AGENCY.  FLIGHT
          INFORMATION MANUAL

FLIGHT INTERNATIONAL
   629.1309 FLI           STACKS    1914,V.6-14,50
                          ENGIN     V.49-

FLIGHT MAGAZINE
   629.1305 SOP           STACKS    1941,V.19-36,39-45,47-

FLINT, MICH.--DEPARTMENT PUBLIC WORKS AND UTILITIES--
DIVISION OF WATER SUPPLY.  REPORT
   SEE    FLINT, MICH.--WATER DEPARTMENT.  REPORT

FLINT, MICH.--WATER DEPARTMENT.  REPORT
   628.1 F646             ENGIN     1947,1953-

FLITCRAFT COMPEND...LISTING PROMINENT LIFE INSURANCE
   COMPANIES
   368.3 F6491            STACKS    1920-1927,1929-1967,1956-
                                    EXCEPT LAST V.
                          COMM      LAST V.

FLITCRAFT, INC.  SETTLEMENT OPTIONS
   368.3 F6493            STACKS    1953,V.12-13,16-   EXCEP
                                    LAST 2 V.
                          COMM      V.13,16,LAST 2V.

FLOOD CONTROL IN THE LOWER MISSISSIPPI RIVER VALLEY
   SEE    UNITED STATES--MISSISSIPPI RIVER COMMISSION.
          FLOOD CONTROL IN THE LOWER MISSISSIPPI RIVER
          VALLEY

FLOODTIDE: THE CHRISTIAN LITERATURE MAGAZINE SERVING ALL
   MISSIONS
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Figure 7. Open-ended Type of Serial Catalog

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